Architecture Design Evolution

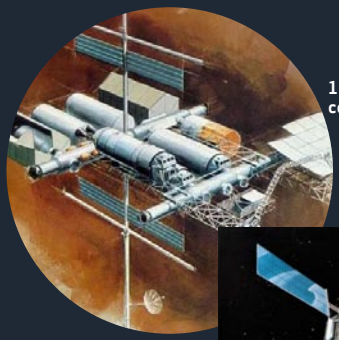
Why does the ISS look the way it does?

The design evolved over more than a decade. The modularity and size of the U.S., Japanese, and European elements were dictated by the use of the Space Shuttle as the primary launch vehicle and by the requirement to make system components maintainable and replaceable over a lifetime of many years.

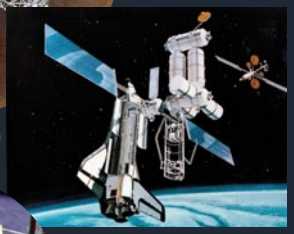
When the Russians joined the program in 1993, their architecture was based largely on the Mir and Salyut stations they had built earlier. Russian space vehicle design philosophy has always emphasized automated operation and remote control.

The design of the interior of the U.S., European, and Japanese elements was dictated by four specific principles: modularity, maintainability, reconfigurability, and accessibility. Interior modular hardware racks and utilities could be replaced as needs or age dictated. Racks could be swung away from the pressure hull of the module in case a meteoritic puncture necessitated a repair. Crew preferences dictated that module interiors be arranged with distinct floors, ceilings, and walls.

Module Design and Layout

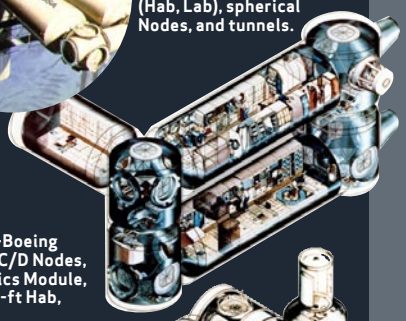


1979—Modules with connecting tunnels.

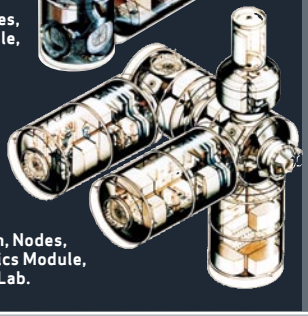


1982—Common modules.

1986—Habitation Module, Laboratory Module (Hab, Lab), spherical Nodes, and tunnels.



1988—Boeing Phase C/D Nodes, Logistics Module, and 45-ft Hab, Lab.



1992—Freedom, Nodes, Airlock, Logistics Module, and 27-ft Hab, Lab.

Module Architecture Early Concepts

1980—Horizontal layout.

1980—Horizontal layout.

1980—Vertical layout.

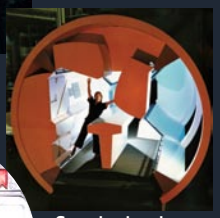
1986—Central core.

1986—Central beam.

Module Architecture Racks with Four Structural Standoffs

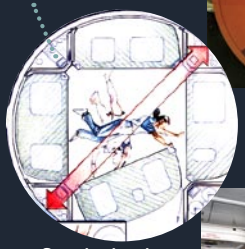
Loft concept.

Modular outfitting.

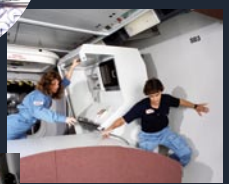


Standard racks (2 sizes).

Standoff

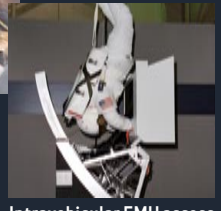


Standard rack (1 size).



Access to module pressure shell.

Access to utility runs in standoffs.



Intravehicular EMU access.